Amendments to the Specification:

Please replace paragraph 2 with the following paragraph:

[0002] A fuel cell is an electrochemical device that produces an electromotive force by bringing the fuel (typically hydrogen) and an oxidant (typically air) into contact with two suitable electrodes and an electrolyte. A fuel, such as hydrogen gas, for example, is introduced at a first electrode where it reacts electrochemically in the presence of the electrolyte to produce electrons and cations in the first electrode. The electrons are circulated from the first electrode to a second electrode through an electrical circuit connected between the electrodes. Cations pass through the electrolyte to the second electrode. Simultaneously, an oxidant, such as oxygen or air is introduced to the second electrode where the oxidant reacts electrochemically in presence of the electrolyte and catalyst, producing anions and consuming the electrons circulated through the electrical circuit; the cations are consumed at the second electrode. The anions formed at the second electrode or cathode react with the cations to form a reaction product. The first electrode or anode may alternatively be referred to as a fuel or oxidizing electrode, and the second electrode may alternatively be referred to as an oxidant or reducing electrode. The half-cell reactions at the two electrodes are, respectively, as follows:

~~$H_2 \rightarrow 2H^+ + 2e^-$~~ ~~$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$~~

$$H_2 \rightarrow 2H^+ + 2e^-$$

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Please replace paragraph 11 with the following paragraph:

[0011] In accordance with an aspect of the invention, there is provided an electrochemical system. The electrochemical system comprises a plurality of cells; a measuring device including a plurality of inputs connected across the plurality of cells to generate voltage and current signals indicative of voltage and current characteristics of the plurality of cells; a current supply/draw means for superimposing modulated current values through the plurality of cells; and a controller for controlling at least one system operating condition based on the voltage and current characteristics received from the measuring device, the

controller being connected to the measuring device, wherein the at least one system operating condition includes at least one of temperature, humidity, and reactant flow rates, within the electrochemical system.

Please replace paragraph 21 with the following paragraph:

[0021] In accordance with a second aspect of the invention, there is provided a method of controlling at least one system operating condition of a multi-cell electrochemical system. The method comprises (a) superimposing modulated current values across a plurality of cells of the electrochemical device; (b) drawing current from the plurality of cells to generate voltage and current signals indicative of voltage and current characteristics of the plurality of cells; and, (c) controlling the at least one system operating condition based on the voltage and current characteristics of the plurality of cells, wherein the at least one system operating condition includes at least one of temperature, humidity, and reactant flow rates, within the electrochemical system.

Please replace paragraph 30 with the following paragraph:

[0030] Figure 2b is a schematic view of a system for measuring fuel cell voltage and resistance according to a further preferred embodiment of the present invention; ~~and~~

Please add paragraph 30.1 following paragraph 30:

[0030.1] Figure 2c is a block diagram illustrating a control device of Figures 2a and 2b in more detail; and,

Please replace paragraph 35 with the following paragraph:

[0035] A fuel cell power unit, generally designated using the reference numeral 10 in Figures 2a and 2b, has a fuel cell stack 90 and a control device 30 for regulating the fuel cell stack 90 according to predetermined fuel cell power unit operation schemes, advantageously stored in the control device 30. The control device 30 of Figures 2a and 2b is illustrated in more detail in Figure 2c. The control

device 30 has a measuring portion 30a with a plurality of inputs ~~(not shown)~~ 25 for connection across the individual cells of the fuel cell (or other electrochemical device), to generate voltage and current signals indicative of the measured voltages and currents, and a controlling portion 30b connected to and controlling the measuring portion 30a and for receiving the voltage and the current signals from the measuring portion 30a. The control device 30 thus maintains the Balance-of-Plant during operation of the power unit 10 by regulating process gas flows, water purging, and other process parameters by manipulating devices such as fans and valves (these different devices are not shown).

Please replace paragraph 36 with the following paragraph:

[0036] The cell voltages of individual fuel cells within the fuel cell stack 90 are measured directly, for instance using a bank of instrumentation amplifiers, which are preferably differential amplifiers ~~(not shown)~~ 31 , which generate voltage signals. The current through the fuel cell stack 90 is measured indirectly using the current sensing device 110. The current sensing device 110 has a known resistive value and near zero inductive or capacitive component, and is connected across a purely resistant component of the load bank in known manner. A differential amplifier (not shown) is connected to the current sensing device 110 to measure the voltage drop across the current sensing device 110, and to generate a current measurement signal. Outputs of the current sensing device 110 are optionally connected to a current amplifier ~~(not shown)~~ 111 having an output for a current measurement signal connected to the controlling portion 30b of the control device 30.

Please replace paragraph 40 with the following paragraph:

[0040] Advantageously, the measuring portion 30a of the control device 30 provides a plurality of primary channels 29 for the voltage and current signals, there being one channel for the voltage across each cell. The measuring portion 30a further includes a splitter ~~(not shown)~~ 32 for separating out DC components of the voltages across the individual cells from the primary channels 29, the channel splitter 32 having first channels 27 as outputs for the DC components across the individual cells.

Please replace paragraph 41 with the following paragraph:

[0041] The splitter 32 advantageously includes second channels 28 as outputs for the AC components of the voltages across the individual cells.

Please replace paragraph 42 with the following paragraph:

[0042] Preferably, the superimposition of the modulated current values is controlled to provide a series of set interference conditions. Then, for each interference condition, at least some of the voltage and current characteristics of the electrochemical device are measured. For example, a frequency of the superimposed current values is varied, the voltage and current and current ~~measur ments~~ measurements and/or ~~wave forms~~ waveforms are measured at selected frequencies for the superimposed current values, and real and imaginary components of the impedance of the individual cells are determined from the voltage and current characteristics measured. Then, the electrochemical device can be controlled partially on the basis of these real and imaginary components of the impedance of the cells.

Please replace paragraph 43 with the following paragraph:

[0043] As described above, ~~The~~ the measuring portion 30a further advantageously includes ~~a~~ the plurality of instrumentation amplifiers ~~(not shown)~~ 31 connected to the plurality of inputs 25 of the measuring device and having outputs providing the plurality of the primary channels 29. Further, an analog multiplexer ~~(not shown)~~ 34 is advantageously connected to at least the first channels 27 from the channel splitter 32, and a multiplexer control line 41 is connected between the controlling portion 30b and the analog multiplexer 34 for controlling the analog multiplexer 34 to switch sequentially between at least the first channels 27.

Please replace paragraph 44 with the following paragraph:

[0044] The fuel cell system 10 further advantageously includes a first analog to digital converter ~~(not shown)~~ 35 connected to the output of the analog ~~12~~ multiplexer 34, a voltage data bus ~~(not shown)~~ 37 connected between the first

analog to digital converter 35 and the controlling portion 30b and an analog to digital control line ~~(not shown)~~ 38 connected between the controlling portion 30b and the first analog to digital converter 35 for control of the same.

Please replace paragraph 45 with the following paragraph:

[0045] A current analog to digital converter (not shown) is advantageously provided having an input connected to the output of the current amplifier 111 and having a current output and a control input. A data bus (not shown) connects the current output to the ~~controller~~ controlling portion 30b and an analog to digital control line (not shown) is provided between the ~~controller~~ controlling portion 30b and the control input of the current analog to digital converter.

Please replace paragraph 46 with the following paragraph:

[0046] ~~A~~ The current sensing device (transducer) 110 is advantageously provided connected in series with the individual cells for measuring the current. The current sensing device 110 is connected to the controller. Outputs of the current sensing device 110 are optionally connected to a the current amplifier 111, which has an output connected to the controller for providing a current measurement signal to the controller.

Please remove paragraph 47.

Please replace paragraph 48 with the following paragraph:

[0048] The controlling portion 30b optionally includes an input, connectable to a computing device ~~(not shown)~~ 39 for supplying control signals for controlling the controlling portion 30b.